

Name: _____

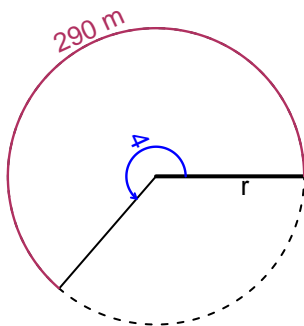
Date: _____

Trig Final (Solution v8)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 290 meters. The angle measure is 4 radians. How long is the radius in meters?

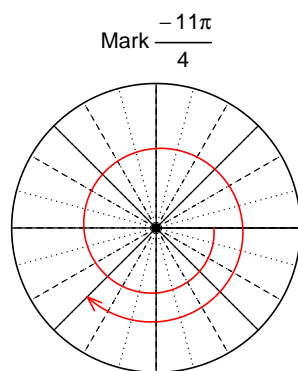


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 72.5$ meters.

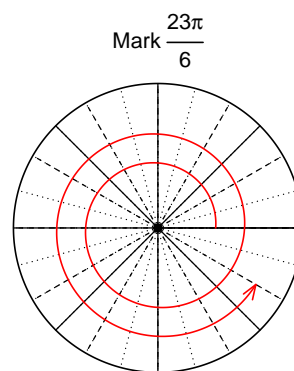
Question 2

Consider angles $-\frac{11\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(-\frac{11\pi}{4}\right)$ and $\sin\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(-11\pi/4)$

$$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$$



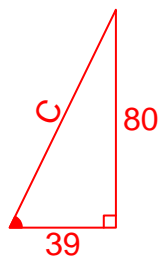
Find $\sin(23\pi/6)$

$$\sin(23\pi/6) = \frac{-1}{2}$$

Question 3

If $\tan(\theta) = \frac{80}{39}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

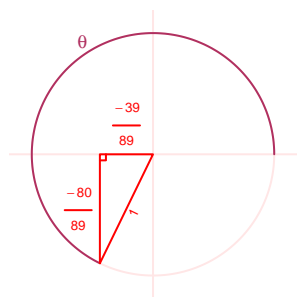
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}39^2 + 80^2 &= C^2 \\ C &= \sqrt{39^2 + 80^2} \\ C &= 89\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-39}{89}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.46$ meters, an amplitude of 4.61 meters, and a frequency of 5.75 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.61 \cos(2\pi 5.75t) + 7.46$$

or

$$y = 4.61 \cos(11.5\pi t) + 7.46$$

or

$$y = 4.61 \cos(36.13t) + 7.46$$